Thermal Characterization of Nitrified and Denitrified Microbiological Mud Encapsulated in Silica Gels

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Aquatic mantles contamination is an increasing problem due to the antropogenic impact and by the lack of efficient and economically viable systems to purify water. The aquatic underground mantle in Yucatán represents the unique water resource for home, agriculture and industry use. However this mantle is extremely vulnerable to infiltration of pollutants due the karstic layer, which is found around 5 to 9 meters deep. Inorganic pollutants such as nitrates are especially dangerous due to their high mobility and stability in aerobic systems in underground waters. It has been found up to 223 mg/L in artesian wells, whereas the maxima limit permitted by the Wealth World Organization is 45 mg/L. A new alternative method to diminish the pollutants levels in the aquatic mantle is to encapsulate biomaterials within ceramic materials. The sol-gel method has been extensively used for the preparation of such materials, permitting a higher stability and viability of useful organisms. In this work, the thermal characterization of nitrified and denitrified mud co-gelled in tetraethoxilane is presented. The characterization was performed by a photopyroelectric technique, whose detector was made with a 110mm PVDF. The cell was constructed in such a way that the sample was inside the cell, and the bottom of the cell was closed by the PVDF foil. Thermal effusivity as a function of temperature was obtained by illuminating the PVDF directly by a modulated 1W Tungsten lamp. The sample is enclosed inside of a chamber, using a Peltier cell that controls temperature in a range from 15°C to 70 °C. The sample is on top of the PVDF, which is illuminated by a modulated tungsten lamp. Optical properties of the system were also analyzed by infrared and in-situ Raman spectroscopy.